(No Model.) 6 Sheets—Sheet 1.

E. CLIFF.

SPRING SETTING MACHINE.

No. 457,073. Patented Aug. 4, 1891.

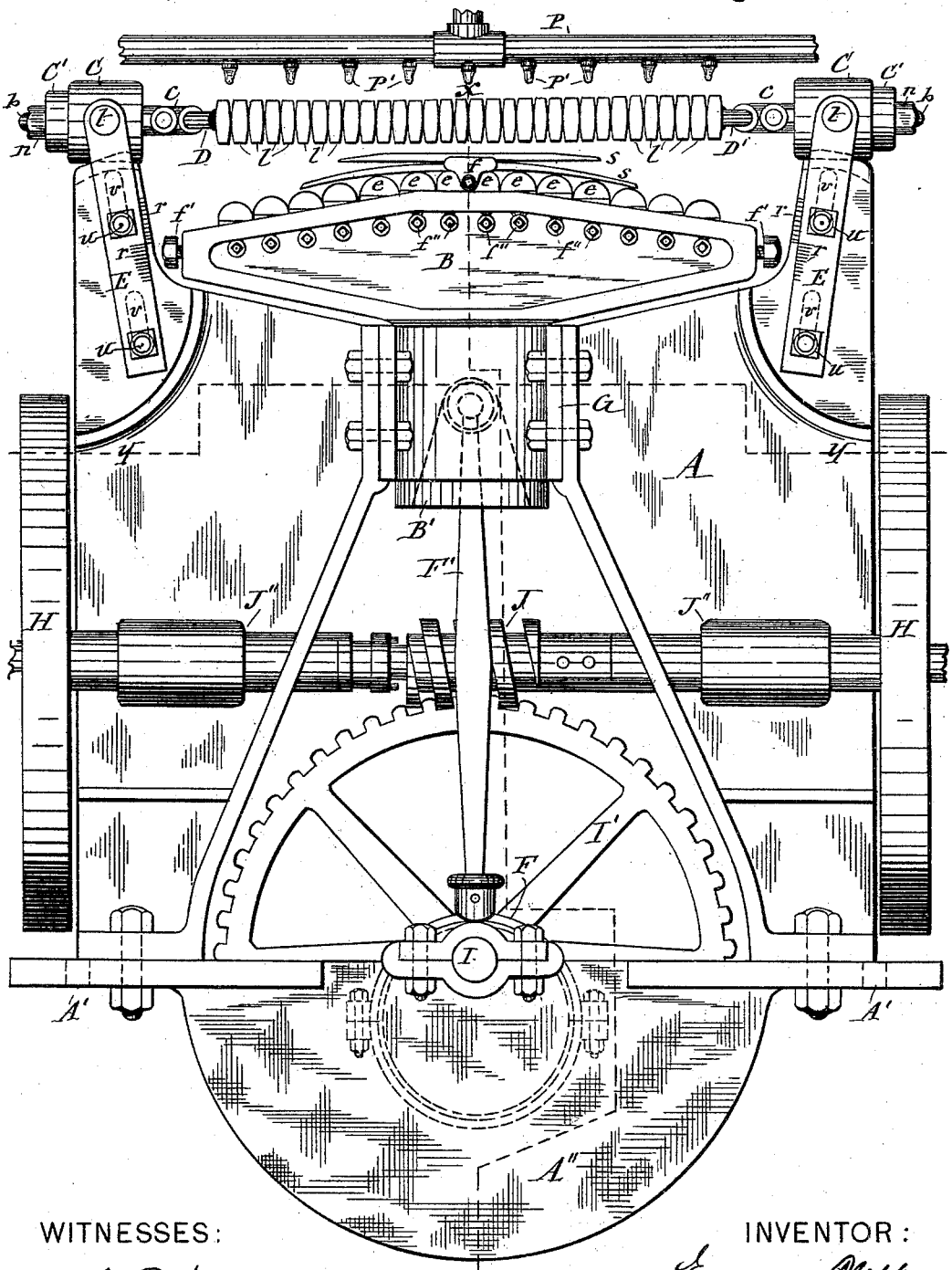

Fig. 1

WITNESSES:

A. F. Walz

J. J. Saacz.

INVENTOR:

Edward Cliff

By Howell, Laasor & Burch

his ATTORNEYS.

(No Model.) 6 Sheets—Sheet 2.

E. CLIFF.

SPRING SETTING MACHINE.

No. 457,073. Patented Aug. 4, 1891.

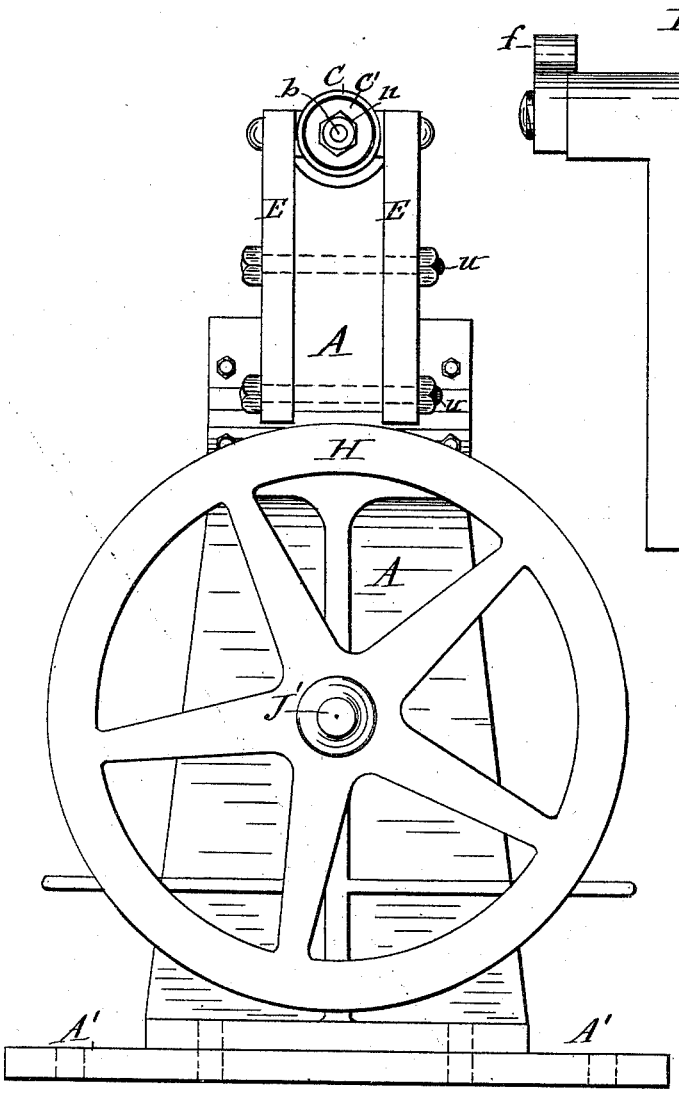

Fig. 2

Fig. 6

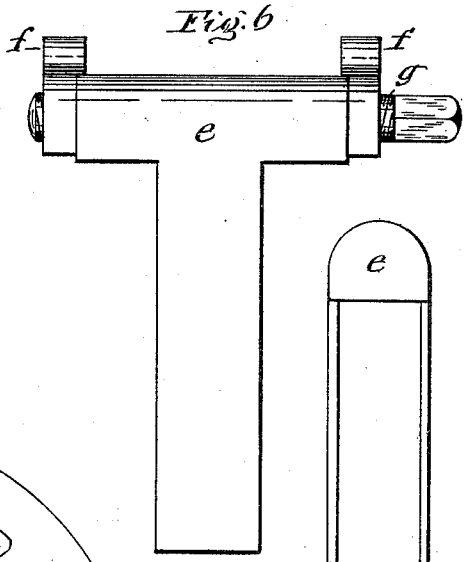

Fig. 7

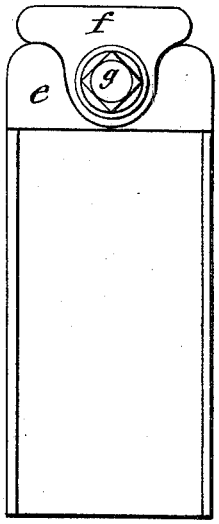

Fig. 5

WITNESSES:

A. F. Walz

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INVENTOR:

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(No Model.) 6 Sheets—Sheet 3.

E. CLIFF.

SPRING SETTING MACHINE.

No. 457,073. Patented Aug. 4, 1891.

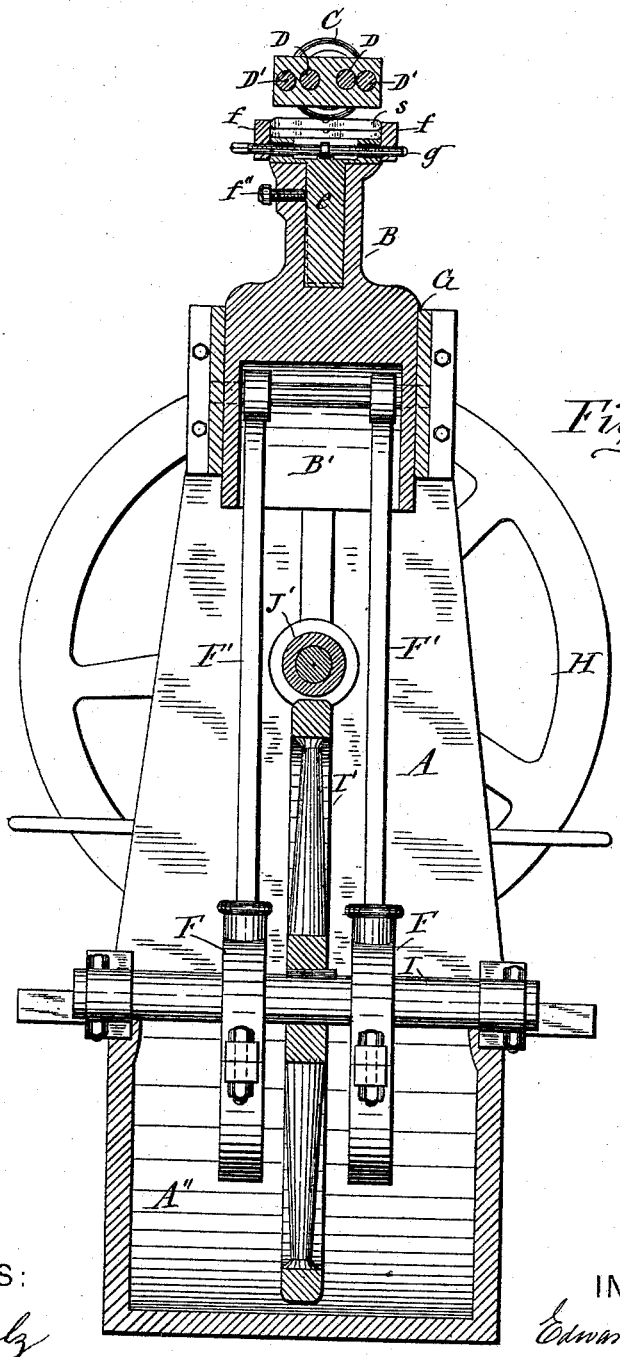

Fig. 3

WITNESSES:

A. F. Walz

J. J. Laass.

INVENTOR:

Edward Cliff

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(No Model.)

6 Sheets—Sheet 4.

E. CLIFF.

SPRING SETTING MACHINE.

No. 457,073. Patented Aug. 4, 1891.

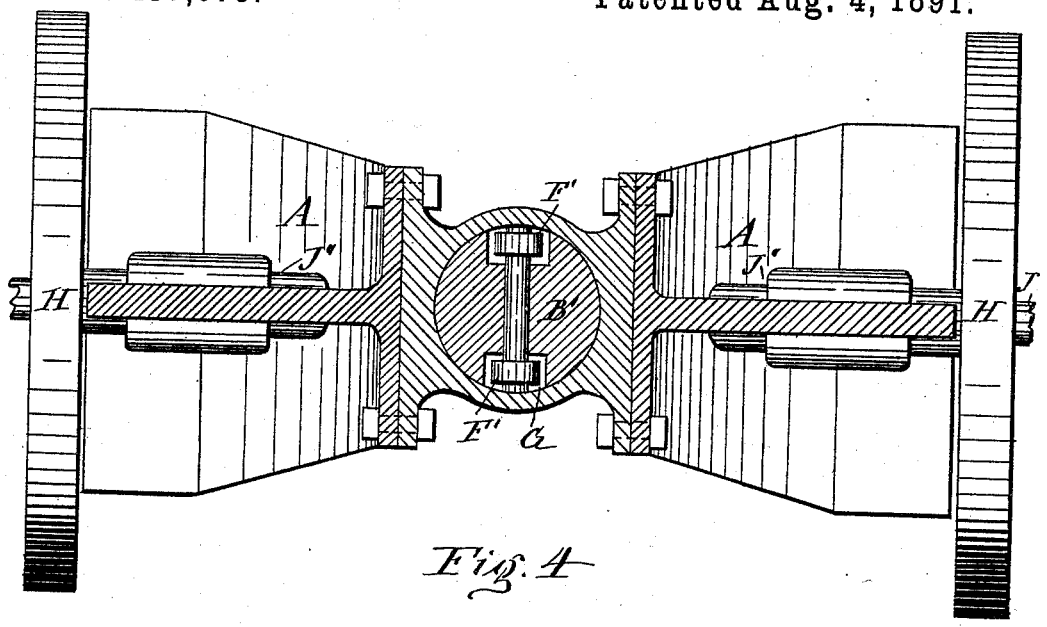

Fig. 4

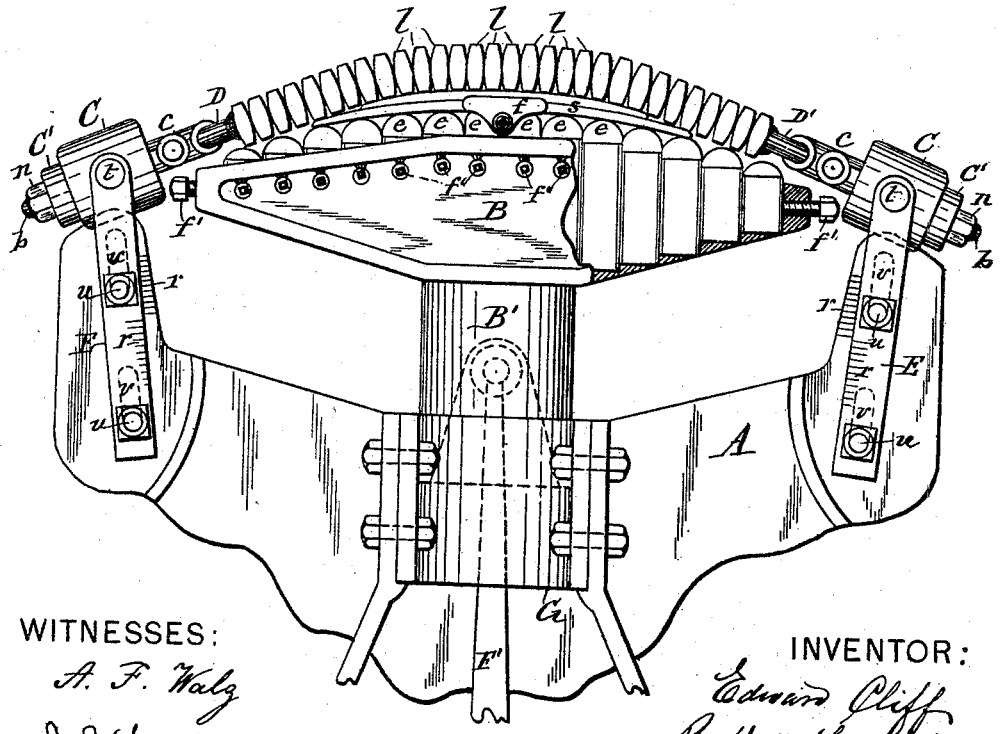

Fig. 8

WITNESSES:

A. F. Walz

J. J. Saalz.

INVENTOR:

Edward Cliff

By Church, Laass & Church

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(No Model.) 6 Sheets—Sheet 5.

E. CLIFF.

SPRING SETTING MACHINE.

No. 457,073. Patented Aug. 4, 1891.

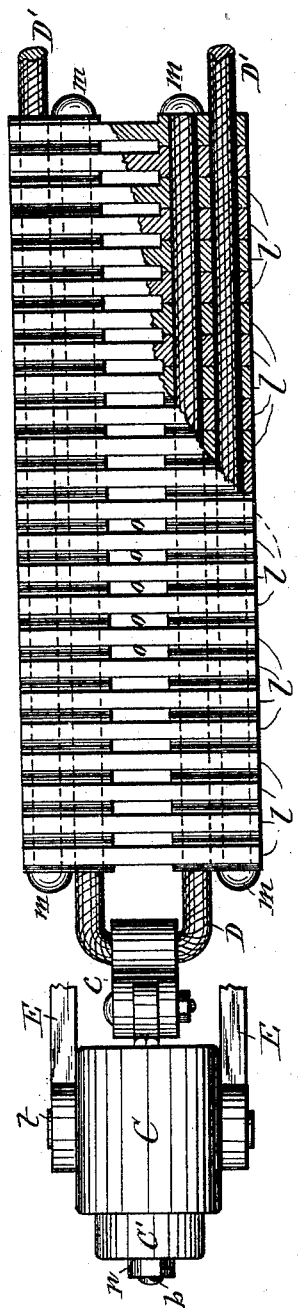

Fig. 9.

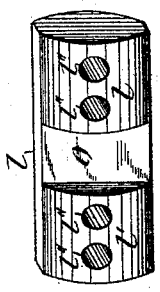

Fig. 11.

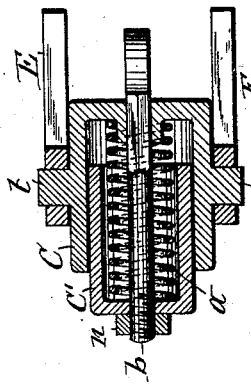

Fig. 10.

WITNESSES:

C. L. Bundixon

J. J. Laass.

INVENTOR:

Edward Cliff

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(No Model.) 6 Sheets—Sheet 6.

E. CLIFF.

SPRING SETTING MACHINE.

No. 457,073. Patented Aug. 4, 1891.

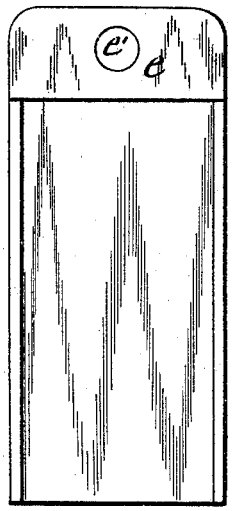

Fig. 12

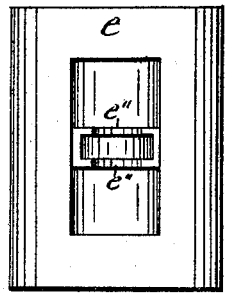

Fig. 13

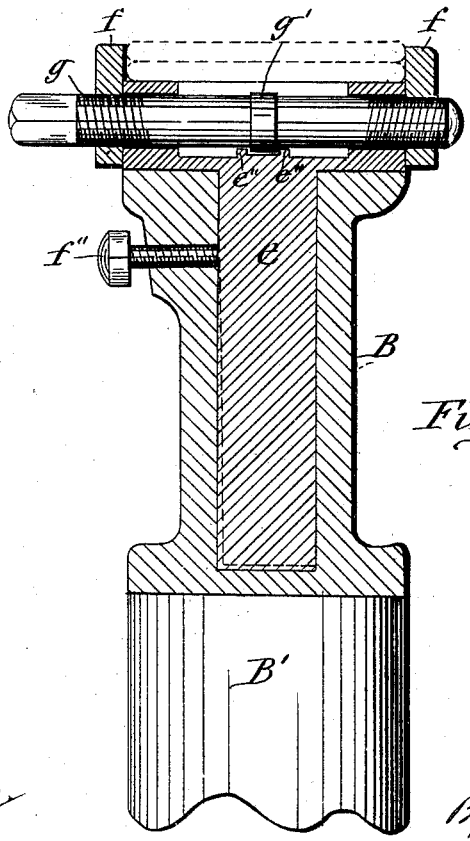

Fig. 14

WITNESSES:

A. F. Walz

J. J. Laass.

INVENTOR:

Edward Cliff

By Dull, Laass & Dull

his ATTORNEYS.

UNITED STATES PATENT OFFICE.

EDWARD CLIFF, OF NEWARK, NEW JERSEY.

SPRING-SETTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 457,073, dated August 4, 1891.

Application filed November 24, 1890. Serial No. 372,451. (No model.)

To all whom it may concern:

Be it known that I, EDWARD CLIFF, of Newark, in the county of Essex, in the State of New Jersey, have invented new and useful Improvements in Spring-Setting Machines, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

This invention relates to devices employed for imparting the requisite bow or arch shape to the leaves of elliptic and semi-elliptic springs; and the invention consists in an improved organization of a machine which is capable of bowing or arching the spring-leaves to the desired degree in a most effective and expeditious manner, and is adjustable to operate on spring-leaves of various dimensions.

The invention is fully illustrated in the annexed drawings, in which—

Figure 1 is a front elevation of a machine embodying my invention. Fig. 2 is an end view of the same. Fig. 3 is a vertical transverse section on line *x x*, Fig. 1. Fig. 4 is a horizontal transverse section on line *y y*, Fig. 1. Figs. 5 and 6 are respectively enlarged detached front and side views of the central bed-piece of the reciprocating spring-holding bed. Fig. 7 is an enlarged detached front view of another of the bed-pieces of the aforesaid bed. Fig. 8 is a front view of the top portion of the machine, showing the same in its operative position. Fig. 9 is an enlarged top plan view of a portion of the flexible spring-bending head. Fig. 10 is a horizontal transverse section of the spring-coupling of said bending-head. Fig. 11 is a perspective view of one of the bearing-blocks of said head. Figs. 12 and 13 are side and top plan views of the central bed-piece of the spring-holding bed, and Fig. 14 is a vertical section of the same seated in the said bed.

Similar letters of reference indicate corresponding parts.

A represents the main supporting-frame of the machine, which is set in an erect position and rests with its base A′ on a suitable foundation, and when the machine is arranged to be operated by gears, as shown, the said frame is formed with a wheel-pit A″, which is set into the ground or foundation.

To the center of the top portion of the frame A is secured a vertical guide G, in which is fitted to slide a hub B′, formed integral with or rigidly attached to the center of the under side of the spring-holding bed B. This bed receives a vertical reciprocating motion or up-and-down movement by means of eccentrics F F, fixed to a horizontal shaft I, which is journaled in suitable bearings on the base of the frame. Pitmen F′ F′ connect the eccentrics with the hub B′, and rotary motion is imparted to the eccentrics by means of a gear-wheel I′, with which engages a worm J, secured to a shaft J′, which is journaled in boxes J″ J″ on the frame A, and has driving-pulleys H H attached to its ends.

The spring-holding bed B consists of an elongated frame, in which are seated the bed-pieces *e e e*, the heads of which project above the top of the said frame. Said bed-pieces are contiguous to each other and are clamped in the frame by set-screws *f′ f′*, inserted in opposite ends of the frame and bearing on the outer sides of the two end bed-pieces *e e*. All of the bed-pieces are adapted to be moved vertically in the frame and to be set so as to cause the tops of said bed-pieces to come to a line more or less arching according to the degree of the arch or crown to be imparted to the spring to be operated on. By means of a series of set-screws *f″ f″*, inserted in the side of the frame and bearing against the inclosed portions of the bed-pieces *e e e*, the latter are retained in their adjusted positions. To properly hold the spring *s* on the reciprocating bed B, I clamp on opposite sides of the central bed-piece *e* two jaws *f f*, and in order to accommodate springs of various widths I make said jaws adjustable in relation to the width between them. For this purpose I preferably provide the jaws *f f* with eyes, which are screw-threaded in opposite directions from each other, and pass transversely loosely through the central bed-piece *e* a right and left screw *g*, which works with its opposite ends in the screw-threaded eyes of the jaws. By turning the screw *g* in one direction the jaws *f f* are caused to recede from each other to allow the spring *s* to be placed between them, and then by turning the aforesaid screw in the opposite direction the jaws are caused to approach each other and grasp

between them the spring *s* so as to hold the same firmly in place. In order to insure the retention of the said spring central over the bed-pieces, I provide the central bed-piece with shoulders *e'' e''* and rigidly secure to the screw *g* a collar *g'*, which is entered between the aforesaid shoulders, and is thereby confined laterally, and thus the screw *g* is prevented from moving longitudinally in the bed-piece *e*.

Over or in front of the spring-holding bed B, and extending lengthwise thereof, is a flexible spring-bending head, which is normally straight and at right angles to the guide G. Said spring-bending head consists, essentially, of a series of bearing-blocks *l l l*, distributed in front and lengthwise of the reciprocating spring-holding bed B, and flexible ties connecting said blocks together and to the frame A. Inasmuch as in the operation of the machine the said flexible spring-bending head is deflected in the shape of an arch by the pressure of the reciprocating bed B and spring *s* lying thereon, I form the bearing-blocks *l l* with convex checks *l' l'* on their adjacent sides to allow said blocks to turn into the different angles which they have to assume in the aforesaid operation of the machine, as illustrated in Fig. 8 of the drawings.

For the flexible ties D and D' I prefer to employ suitable wire cables, each of which I bend at the center of its length so as to bring the two end portions parallel side by side. Each of the bearing-blocks *l* I provide with two pairs of transverse perforations *l'' l''*, as shown in Fig. 11 of the drawings. Each of the cables passes through one of the pairs of perforations of the bearing-blocks *l l l*, and is tied at its extremities by a knob or head *m* on the same.

To allow the normally-straight spring-bending head to be sprung into the shape of an arc by the pressure of the reciprocating spring-holding bed B, I connect the said head to the frame A by means of suitable spring-couplings, and also preferably provide said couplings with hinges *c c*. To insure efficiency in the operation of the said spring-couplings, I form each of a box C, which has trunnions *t t* on opposite sides and is open at its outer end. Said box is pivoted by its trunnions to the upper ends of arms E E, secured to the front and rear of the top portion of the frame A and extending upward therefrom. In the box C slides a piston C', and between said parts is interposed a stout spiral spring *a*, as shown in Fig. 10 of the drawings. Axially through the said piston and box passes the coupling-bolt *b*, the inner end of which is connected to the cable D by a hinge *c*, and the outer end of said coupling-bolt is screw-threaded and provided with a nut *n*. By tightening said nut the tension of the spring *a* is adjusted to the requisite degree to exert the necessary resistance to the draft of the cables D D' incident to the deflection thereof when subjected to the pressure of the spring-holding bed B. The degree of the pressure of the bed B against the flexible spring-bending head is rendered adjustable by regulating the normal distance between the said parts, and for this adjustment I dispose the arms E E with their upper ends inclined outward and connect said arms to the frame by bolts *u u*, passing through the arms and through slots *v v* in the frame A, and parallel with the arms, as shown by dotted lines in Fig. 1 of the drawings. Said slots allow the arms E E to be raised or lowered to carry the flexible spring-bending head a greater or less distance from the bed B.

Graduated scales *r r* are marked on the edges of the arms E E and adjacent portions of the frame A, by which scales the adjustment of the said arms can be determined.

For the purpose of cooling the blocks *l l l*, cables D D', and underlying parts, I extend over the top of the machine parallel with the cables D D' a water-supply pipe P, which is provided with nozzles P' P', as shown in Fig. 1 of the drawings, and the blocks *l l* I form with vertical grooves *o o* on their adjacent sides to allow the water to pass down to the underlying spring *s* and its supporting-bed B.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In combination with the frame and reciprocating spring-holding bed, a series of bearing-blocks distributed in front and lengthwise of said bed, flexible ties connecting said blocks, and spring-couplings connecting said ties to the frame, as set forth.

2. In combination with the frame A and reciprocating spring-holding bed B, the boxes C C, pivoted to the frame at opposite ends of the said bed, pistons C' C', sliding in said boxes, springs *a*, interposed between the pistons and their respective boxes, flexible ties D D', connected to said pistons, and bearing-blocks *l l l*, connected to said ties, as and for the purpose set forth.

3. In combination with the frame A and reciprocating spring-holding bed B, the boxes C C, connected to the frame at opposite ends of said bed, pistons C' C', springs *a a*, hinges *c c*, connected to said pistons, flexible ties D D', connected to said hinges, and bearing-blocks *l l l* on said ties, as set forth.

4. In combination with the frame A and reciprocating bed B, the arms E E, extending upwardly from the frame and connected to said frame, longitudinally-adjustable spring-couplings connected to said arms, a series of bearing-blocks distributed in front and lengthwise of the bed B, and flexible ties connecting said bearing-blocks together and to said spring-couplings, as set forth.

5. In combination with the frame A and reciprocating bed B, the arms E E, extending upwardly from the frame and connected thereto adjustably longitudinally, the boxes C C,

pivoted to said arms, pistons C′ C′ in said boxes, springs interposed between said pistons and boxes, flexible ties connected to said pistons, and bearing-blocks connected to said ties, as set forth.

6. In combination with the frame and reciprocating spring-holding bed, the flexible spring-bending head consisting of the separate wire cables D D′, connected, respectively, to the frame at opposite ends of the aforesaid bed, a series of bearing-blocks *l l l*, strung on said cables, and heads on the ends of the cables bearing on opposite ends of the series of bearing-blocks, substantially as set forth.

7. In combination with the frame and reciprocating spring-holding bed, the flexible spring-bending head consisting of the series of bearing-blocks *l l l*, having convexed checks *l′ l′* and perforations *l″ l″*, and the wire cables D D′, connected to the frame respectively at opposite ends of the spring-holding bed and passing through the perforations of the said bearing-blocks and tied at their free ends to the ends of the series of blocks, substantially as described and shown.

8. In combination with spring-holding bed, the spring-bending head provided with slots extending vertically through said head, and the water-supply pipe P, communicating with said slots, as set forth.

9. In combination with the spring-holding bed, the bearing-blocks flexibly connected together and formed with convexed checks *l′ l′* and grooves *o o*, and the water-supply-pipe P, having nozzles P′ P′ communicating with the grooves *o o*, substantially as described and shown.

10. In combination with the frame A, reciprocating spring-holding bed B, and flexible spring-bending head D D′ *l*, the boxes C C, pistons C′ C′, springs *a a*, interposed between said boxes and pistons, the coupling-bolts *b b*, passing through the pistons and boxes and connected at their inner ends to the flexible spring-bending head and screw-threaded at their outer ends, and adjusting-nuts *n n* on said outer ends of the coupling-bolts, as and for the purpose set forth.

In testimony whereof I have hereunto signed my name this 15th day of November, 1890.

EDWARD CLIFF. [L. S.]

Witnesses:
MARK W. DEWEY,
H. M. SEAMANS.